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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/707,259	12/02/2003	Hsiu-Chun Lee	NTCP0028USA	1258

27765 7590 09/22/2006

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EXAMINER

CHACKO DAVIS, DABORAH

ART UNIT	PAPER NUMBER
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1756

DATE MAILED: 09/22/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/707,259

Applicant(s)

LEE ET AL.

Examiner

Daborah Chacko-Davis

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 02 December 2003.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-7 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-7 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- ☒ Notice of References Cited (PTO-892)
- ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- ☐ Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date _____
- ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____
- ☐ Notice of Informal Patent Application
- ☐ Other: _____

DETAILED ACTION

Claim Rejections - 35 USC § 112

1. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

2. Claims 5-7, are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention.

Claim 5, recites "thickness of said silicon thin film on said vertical sidewalls is "x", while thickness of said silicon thin film on said top surface is "y", wherein $xx < 0$ ". It is not clear what "xx" is. Claim 6, at lines 2-3, and claim 7, at lines 2-3, recite "wherein $xx < 0$ Angstroms". The specification does not suggest or teach a numerical value for "xx". The specification does not define the silicon film thickness in terms of "xx". The specification in paragraph no. [0008], and in paragraph no. [0012], merely recites the exact phrase of claim 5 (quoted above i.e., " $xx < 0$ "). Appropriate correction is required.

3. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

4. Claims 1-7, are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

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5. Claims 1-7, are rejected under 35 U.S.C. 112, second paragraph, as being incomplete for omitting essential elements, such omission amounting to a gap between the elements. See MPEP § 2172.01. Claims 1-7, recite "a critical dimension control method". The body of the claims merely recites a hard mask patterning method. There is no suggestion in the claims in regards to CD measurements, or thickness determinations etc., or how the CD of the pattern is controlled. Appropriate correction is required.

Claim 5, recites a variable "wherein $xx < \dots$ ". It is not clear what " xx is less than...". It is not clear what " xx " stands for. Appropriate correction is required.

Claim Rejections - 35 USC § 103

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

7. Claims 1-4, are rejected under 35 U.S.C. 103(a) as being unpatentable over U. S. Patent No. 6,346,366 (Chu et al., hereinafter referred to as Chu) in view of U. S. Patent Application Publication No. 2004/0224524 (Koenig et al., hereinafter referred to as Koenig) and U. S. Patent No. 6,533,907 (Demaray et al., hereinafter referred to as Demaray).

Chu, in the abstract, in col 2, lines 58-67, in col 3, lines 1-15, in col 4, lines 61-67, in col 5, lines 1-18, discloses a method patterning a semiconductor substrate comprising coating a substrate with a polysilicon layer (semiconducting layer), followed

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by a silicide layer (semiconducting layer); forming a silicon nitride layer (cap layer) on the silicide layer; forming a photoresist pattern on the silicon nitride layer (cap layer); performing an anisotropic dry etching, using the photoresist pattern as the etch hard mask, to etch anisotropically (therefore maintaining the CD of the photoresist pattern) the exposed portions of the silicon nitride layer (semiconductor layer) so as to transfer the photoresist pattern (dimensions of the pattern transferred to the underlying layers) to the silicon nitride layer; performing an anisotropic dry etching, using the patterned silicon nitride hard mask as the etch mask, to transfer the pattern to the semiconductor layer (claims 1-4).

The difference between the claims and Chu is that Chu does not disclose sputtering silicon on the top surface and the vertical sidewalls of the photoresist pattern, and using the silicon thin film and the photoresist pattern as the etching hard mask.

Koenig, in [0020], [0021], and [0023], discloses forming a silicon layer on the sidewalls and top surface of the resist pattern (coating covering the resist feature conformally), and using the silicon coated resist pattern as the mask to perform further etching.

The difference between the claims and Chu in view of Koenig is that Chu in view of Koenig does not disclose that the silicon deposited on the top surface and sidewalls of the resist pattern is deposited by sputtering.

Demaray, in col 8, lines 45-62, discloses that the silicon is sputter-deposited to form the silicon hard mask.

Therefore, it would be obvious to a skilled artisan to modify Chu by employing the suggestion of Koenig to conformally coat the resist feature (pattern) with the silicon layer because Koenig, in [0020], discloses that the silicon coating covering the resist feature enables the preservation of the lateral dimensions of the mask during the etch processes, and Koenig in [0023], discloses that the silicon coating on the resist feature inhibits the etching of the resist feature sidewall during etch processes. It would be obvious to modify Chu in view of Koenig by employing the method of sputter coating the silicon layer as suggested by Demaray because Demaray, in col 8, lines 45-64, discloses that the sputter coated silicon hard mask has a smoother surface and is well-suited for use as hard mask for etching features with required sidewall smoothness for use in IC devices.

Conclusion

8. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Daborah Chacko-Davis whose telephone number is (571) 272-1380. The examiner can normally be reached on M-F 9:30 - 6:00. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mark F Huff can be reached on (571) 272-1385. The fax phone number for the organization where this application or proceeding is assigned is (571) 273-8300. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For

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more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

dcd

September 15, 2006.



**JOHN A. MCPHERSON
PRIMARY EXAMINER**